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# Some Symptoms Of Citrus Malnutrition In Florida

... By ...  
A. F. CAMP AND  
B. R. FUDGE

In Bulletin 335, Florida Agricultural Experiment Station

## Introduction

One of the outstanding recent developments in the field of citrus nutrition has been utilization of the symptoms found on leaves, twigs, and fruits as guides in fertilization. Research which has revealed the specific relationship between nutritional requirements and certain symptoms exhibited by the citrus tree has furnished the basis for this development. Thus it has been found that zinc is a specific remedy for "frenching" and copper for "dieback" and that neither will fill the role of the other. Likewise, deficiency of either manganese or magnesium will give rise to certain definite symptoms in the citrus tree, whereas an excess of boron will produce equally specific symptoms which are characteristic of the toxic effects of this element. These symptoms have proved much more specific than at first supposed and serve as excellent indicators of the tree's nutritional needs. The idea of using an element as a specific remedy for a particular set of symptoms is not entirely new, since copper has been used as a specific for "dieback" for many years.

In Florida nitrogen deficiency has been generally accepted in the past as the cause of practically all yellowing of citrus leaves and it is only recently that the various types of yellowing have been adequately classi-

fied with the result that magnesium deficiency is now recognized as the cause of the commonest type of yellowing. Much of the progress made has resulted from more detailed and critical observation of the trees themselves; and the practical utilization of symptoms as a guide in citrus nutrition requires equally careful observation, particularly when symptoms of several different types are combined in such a way as to mask partially one or more of them.

Since the field is new the information is not complete nor the conclusions final, but an attempt is being made to bring to those interested, and to growers in particular, the gist of the pertinent information available at present. Primary attention is given those symptoms which have been found to be good practical guides in grove care and those of only academic interest will be omitted or referred to only briefly. General principles involved in the occurrence and treatment of deficiencies and toxicities are discussed, but detailed recommendations for treatment are not included since these are being continually changed through research work and the current recommendations will be found from year to year in the publications of the Agricultural Experiment Station and other research agencies. In addition to offering in a single publication descriptions and illustrations which may serve as practical grove guides, this bulletin is also intended as a refer-

ence work on the various symptoms of malnutrition in citrus and will be referred to from time to time in the publication of the results of research work now in progress.

While the symptoms are, in many cases, the most sensitive and reliable indicators we have, it should be remembered that the problem is essentially a soil problem in many of its phases. A tree may receive insufficient quantities of an element for a number of reasons, most of which involve the soil in one way or another. An element may become deficient because it is fixed in an unavailable form in the soil, as zinc and manganese are fixed in marl soils; or it may be leached from the soil, such leaching frequently being aggravated by too much acidic material applied to the soil; or it may be "cropped out" when heavy crops are removed and the element in question is not added in fertilization. Both leaching and fixation are influenced to a large degree by soil reaction (pH) and proper soil management may greatly reduce such losses, whereas "cropping out" is primarily due to failure to add the proper materials in the course of fertilization. Other causes also may be active but the above are the most important in Florida. The chief influencing factor outside of the soil is in the tree itself; for example, the extreme deficiency of one element may so injure the absorptive system of the tree

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# Reflections : - :

By The Observer

The writer admits to being something considerably less than a genius but even so he is disposed to believe himself entitled to a free-for-all comment upon the present citrus price situation.

Starting right from taw most folks in the know will admit that at the bottom of our present price difficulties is the fact that much of our fruit in the market early this season lacked a great deal of being first class eating fruit. This is particularly true of our early oranges which compete with fully matured California Valencias.

It is our opinion that this one thing is the fundamental difficulty which marks the difference between Florida and California fruit prices.

Depending upon whom you are talking to you may elicit any one of several reasons why this condition exists. One individual tells us that the fruit is cooked to death in the coloring rooms—that as a result it loses palatability and will not keep. Another will tell you that color-added, despite the new laws disguises fruit that we would not serve on our own tables. Others will lay all the blame on certain varieties of early oranges. Some old timers say it is much worse this year due to the long heavy rainy season.

In the Jacksonville Times-Union recently we saw the editorial comment made upon the experience of a well known newspaper man in the state who went to New York and while there asked certain fruit brokers why it was that Florida fruit was bringing lower prices than California fruit.

He was advised to go to various stores and buy Florida oranges, which he did. Upon cutting the fruit and tasting it the Florida newspaper man reported that it was not only unpalatable but in many cases was so dry and pulpy as to be entirely unsuited for eating purposes.

As we see it, while there can be no doubt that much fruit is injured by being left too long in coloring rooms, the basic difficulty lies in two things. First, much of our early fruit is getting to market before it is ready—and second, many Florida growers, through lack of adequate and proper attention to fertilization requirements are permitting the quality of their fruit to deteriorate on

the trees.

It has not been so long ago that virtually every citrus grower considered it simply a part of recognized good practice to give his grove two or three applications of good fertilizer each year. The present day fertilizers of recognized standard are the embodiment of the latest studies of what is up-to-date in this line just as the modern, streamlined car is an improvement over the old T-model. The modern fertilizers reflect the findings of scientific research and the plant foods they contain are included as the result of their recognized effects upon the soil.

On the other hand, economic conditions and other causes have been responsible for many growers listening to the call of the "cure-all" specialists of whom there are many in Florida today. Some of these "experts" would have us believe that the grove programs recommended by our Citrus Experiment Station and others who have devoted years of study to the problem and have found them proven sound over a period of years in actual practice over the entire state, are totally without merit.

Personally we haven't a dime's worth of fertilizer to sell, but between the sound, proven methods backed by science and experience as compared to the "shot in the arm" system we believe the fruit itself will provide the answer to any unprejudiced judge.

The Better Fruit Committee of the Citrus Commission presented the growers of Florida with a sound and helpful program of spraying and dusting, now in its fourth year, which had been prepared by the committee in co-operation with a technical advisory committee representing the Experiment Station, Agricultural Extension Service, United States Department of Agriculture and others.

This year The Better Fruit Committee of the Commission, E. G. Todd, chairman, in cooperation with the Citrus Experiment Station, United States Department of Agriculture, Citrus Inspection Bureau and the industry generally is making a study which promises to be equally helpful to the industry. It is based upon a study of the relation of grove practices to shipping and eating quality of fruit and a study of the rela-

tion of packing houses practices influencing the same features, with particular reference to coloring room operation and various treatments given fruit such as washes, dips, dyes, waxes, etc.

Such a study of course must include the fertilization problem, and while it is not our desire to try to sell the industry any one brand of fertilizer over another, or to set up any one individual as the sole and only source of authority, it is our personal opinion that Dr. A. F. Camp, head of our state citrus experiment station may be looked upon as the outstanding authority on the care of citrus problems and the development of fine citrus fruit.

We have deliberately refrained from talking with Dr. Camp about the reported faulty condition of our fruit in the markets, as we wanted to present our layman's ideas of the trouble.

We intend to consult with him during the coming month however, and we'll gamble that our reactions to the present situation are not far wrong.

Selling citrus fruit in principle is the same as selling shirts—you can't get top prices for a shoddy piece of goods. On the other hand you can always top the market with a fine piece of goods—and this applies whether it is citrus or automobiles you may be selling.

## NATIONWIDE CITRUS DRIVES BEGIN

The first of a group of national citrus sales, with 189,000 retail outlets putting the full force of their enormous sales energy behind oranges, opened Nov. 9 and continued until Nov. 25. Another nationwide sales drive on oranges, grapefruit and tangerines will be conducted Dec. 18 to 30.

Similar citrus sales were held last season and are credited with aiding materially in disposing of the largest crop of citrus on record. Florida, California and Texas cooperate on these sales.

The sale during November was not intensive as future drives, it was said, because of the comparatively short period available for preparation. Retailers have indicated they

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December, 1939

## California Growers Protest Against the Wage-Hour Law

Officials of the Wage-Hour Act were defendants November 15 in a complaint on file in Federal Judge Leon R. Yankwich's court which seeks to restrain them from enforcing provisions of the Act against agricultural workers in California and Arizona.

The action was filed by Ivan G. McDaniel, attorney for the Agricultural Producers Labor committee, on behalf of nine major citrus packing organizations and contends that inclusion of agricultural workers under the Act is contrary both to the provisions of the Act itself and to the intent of Congress and that it is discriminatory and harmful in its effect.

Specifically, the complaint alleges that "although it was the intent of Congress to exempt agricultural workers from the provisions of the Act, former Administrator Elmer F. Andrews arbitrarily included them by his definition of an "area of production" which said that such workers were industrial workers if they worked in a packing house located in a town of more than 2500 population or if the product handled was hauled a distance of more than 10 miles, or if the establishment employs more than seven persons.

"This definition is unjust and discriminatory in that it includes approximately 40 per cent of the citrus packing houses in California and Arizona, increases their costs of operation and leaves the other 60 per cent with a tremendous advantage in lower overhead and labor costs."

The complaint further declares that the inclusion of agricultural workers under the terms of the Act works a hardship on them.

"Agricultural labor is seasonal and many workers must earn enough during the peak harvest seasons to support themselves during the remainder of the year. Any curtailment of their working hours during this peak of the season seriously curtails their earning power."

The plaintiffs asks that the court find that an "area of production" for operation of the Wage-Hour Act be defined as it was by Secretary of Agriculture Henry A. Wallace under the order and license of the Agricultural Marketing Agreement Act of 1937 pertaining to the proration

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of citrus. Wallace's definition of an "area of production" stated that all counties in California and Arizona producing citrus commercially were one "area of production."

Judge Yankwich set a hearing for December 4, at which time the defendants, Harold D. Jacobs, Administrator of the Wage-Hour Act, and his assistants, Philip Fleming, Wesley O.

Ash and Lawrence A. Peifer, together with Benjamin Harrison, U. S. District Attorney, will be asked to show cause why an injunction should not be issued restraining them.

Florida citrus growers were granted a preliminary injunction in the Federal court against enforcement of the Wage-Hour Act as to their pack-

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Seven



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# SOME SYMPTOMS OF CITRUS MALNUTRITION IN FLORIDA

(Continued from page 5)

as to hinder the absorption of other elements so that they may in turn become deficient within the tree although present in adequate amounts in the soil. Thus the symptoms are primarily a reflection of the condition within the tree itself although the fundamental causes usually lie directly or indirectly in the soil. Included with the discussion of each element will be given a brief resume of soil problems involved, as far as they are understood today, but this field is relatively new and the conclusions may be subject to considerable modification in the course of additional research work.

Since the occurrence of deficiencies is tied up inextricably with the soil, an understanding of soil problems is a necessity. While it is not possible to present a discussion of technical soil problems in this bulletin, it should be remembered that a major portion of the citrus industry of Florida is located on light sandy soils of low natural fertility. When such soils are heavily cropped and are fertilized with only nitrogen, phosphorus, calcium, sulfur, and potassium, other elements necessary to plant growth rapidly become depleted or "deficient." These sandy soils present an acute problem because of both their low fertility and the extent to which they are planted to citrus. Other soil types extensively used for citrus contain large excesses of carbonates which have a tendency to fix manganese, zinc, iron, and other elements and render them unavailable to the plant. It was only after the need for these elements in citrus nutrition was recognized and they were supplied to trees on such soils that many of the groves have become productive. Discussions of Florida citrus soils have been presented by Peech, and these publications should be studied in connection with this bulletin.

Modifications of symptoms are given considerable attention, particularly with reference to the interrelations of deficiencies, but modifications based on certain tree conditions should be called to the attention of the reader. Poorly adapted rootstocks almost always carry an intensification of deficiency symptoms, particularly in the case of sour orange stock on light sandy soils. Extremely heavy cropping tends to intensify most of the deficiencies and the outward expression of some of them is associated with crop production. Varieties producing seedless or nearly seedless fruits usually are less affected than seedy varieties. Extreme drought usually intensifies symptoms partly because of reduced availability of elements in the soil and partly because of injured root systems. In general, all things which reduce tree vigor tend to intensify the various deficiencies through reducing the absorptive power of the root system.

The terms **deficiency** and **toxicity** are used to designate certain tree conditions associated with specific symptoms. "Deficiency" will be used when an element is indicated as a specific corrective, although a deficiency may be only relative and not absolute. The common names will be included, but it is hoped that these will be eliminated eventually since they are neither specific nor constant but vary with both locality and crop, i. e., **zinc deficiency** in citrus is termed **frenching** in Florida and **mottle-leaf** elsewhere, while **zinc deficiency** in tung trees is termed **bronzing**. The term "toxicity" will be used in connection with the symptoms arising from the use of an excess of an element which is toxic. Again it may be argued that this is only relative, but it serves a useful purpose in indicating those things that are to be avoided.

The symptoms of the following deficiencies will be discussed and illustrated: Copper, zinc, manganese, magnesium, nitrogen, iron, and boron. The terms "minor elements" and

"secondary elements" are not used since they tend to be somewhat misleading. The role of copper is not considered to be essentially less important than the role of potassium or calcium, and certainly since its deficiency will result in total crop loss, its role cannot be a "minor" one or its application of minor importance. The recognized difference is primarily a difference in the amount required and from that standpoint a classification of "micro" and "macro" elements would be justifiable. In this case copper, zinc, manganese, boron, and iron would fall in the "micro" class, while magnesium would fall in the "macro" class as far as citrus is concerned. In Table 1 will be found typical analyses of citrus leaves which show the wide variation in the amount of individual elements in any given sample. Attention is called, for instance, to the amounts of calcium, potassium, and nitrogen as compared with the amounts of manganese and copper, illustrating the difference between "macro" and "micro" elements. As far as citrus fertilization in Florida is concerned it would probably be better to eliminate classifications and accept all of the elements required simply as plant nutrients.

Copper and zinc deficiencies are discussed first because they were the first identified and occur most widely in the citrus areas of the world; and manganese deficiency is grouped with them because it is closely related in many ways. All three of these elements are needed in very small amounts by the tree; the symptoms of all of them are coincidental with growth and mature normal foliage or fruit does not develop the symptoms; soil conditions affect the availability of all three elements in much the same manner, although in different degrees. Magnesium deficiency is equally important in Florida and is discussed next but has certain distinct characteristics from the above three—this element is needed in relatively much larger amounts, it does

TABLE 1.—Composition of Various Lots of Citrus Leaves in Percent of Dry Matter.

| Variety      | Source           | Ash   | N    | P     | K     | Ca   | Mg    | Na    | S     | Cl    | Fe    | Mn     | Al     | Cu      | Notes          |
|--------------|------------------|-------|------|-------|-------|------|-------|-------|-------|-------|-------|--------|--------|---------|----------------|
| Valencia     | N. S. Wales      | 18.05 | 2.27 | 0.101 | 0.717 | 4.86 | 0.247 | 0.196 | 0.154 | 0.125 | 0.015 | 0.0012 |        |         |                |
| Valencia     | Solution Culture | 16.82 | 2.79 |       | 6.48  | 1.48 | 0.190 | 0.270 |       | 0.80  |       |        |        |         |                |
| Orange       | California       |       |      |       |       |      |       |       |       |       | 0.035 |        |        | 0.00069 |                |
| Lemon        | California       |       |      |       |       |      |       |       |       |       | 0.029 |        |        | 0.00131 |                |
| Grapefruit   | California       |       |      | 0.181 |       |      |       |       |       |       | 0.020 |        |        | 0.00074 |                |
| Wash. Navel  | California       |       |      | 0.186 |       |      |       |       |       |       | 0.018 |        |        | 0.00111 |                |
| Valencia     | California       |       |      | 0.181 |       |      |       |       |       |       | 0.020 |        |        | 0.00128 | Copper-treated |
| Valencia     | Solution Culture | 15.15 | 2.92 | 0.230 | 5.64  | 1.12 | 0.150 | 0.380 | 0.420 | 0.27  |       |        |        |         |                |
| Valencia     | California       | 18.96 | 1.94 | 0.141 | 0.110 | 3.68 | 0.328 | 0.269 | 0.202 | 0.087 | 0.010 |        |        |         | Green leaves   |
| Parson Brown | Florida          |       |      |       |       | 2.78 | 0.108 |       |       |       | 0.008 |        |        |         | Bronzed leaves |
| Parson Brown | Florida          |       |      |       |       | 2.19 | 0.029 |       |       |       |       |        |        |         | Untreated      |
| Parson Brown | Florida          |       |      |       |       | 3.45 | 0.201 |       |       |       |       | 0.0028 |        |         | Mn-treated     |
| Parson Brown | Florida          |       |      |       |       | 3.17 | 0.224 |       |       |       |       | 0.0045 |        |         |                |
| Duncan Gft.  | Florida          | 16.30 | 2.17 | 0.109 | 2.66  | 4.11 | 0.156 |       |       |       | 0.032 | 0.0033 | 0.0076 |         | Green leaves   |
| Duncan Gft.  | Florida          | 14.53 | 1.71 | 0.104 | 2.22  | 3.48 | 0.017 |       |       |       | 0.041 | 0.0027 | 0.0097 |         | Bronzed leaves |
| Marsh Gft.   | Florida          | 13.99 | 2.23 | 0.181 | 2.71  | 3.59 | 0.228 |       |       |       | 0.018 | 0.0033 | 0.0090 |         | Green leaves   |

1 These elements are, in order: Nitrogen, phosphorus, potash, calcium, magnesium, sodium, sulfur, chlorine, iron, manganese, aluminum and copper.

not fix in alkaline soils, and the symptoms show up on mature leaves that were normal during the early stages of their development. Nitrogen deficiency is briefly discussed because of its relationship to other deficiencies but will be the subject of further papers in the future. Finally, iron and boron deficiencies are included, although neither of them is satisfactorily worked out as far as symptoms or control is concerned. The discussion of these two is purely tentative and both will have to be the subject of future reports.

#### Copper Deficiency

Copper deficiency is commonly known as "dieback" (Florida), the name being derived from the dying back of the twigs; "ammoniation" (Florida), derived from its frequent association with heavy application of nitrogen (ammonia); and "exanthema" (Florida and California), derived from the Greek and referring primarily to the excrescences on the surface of the twigs and fruit. It was first described on oranges in Florida in 1875 by Fowler who considered the casual agent to be a fungus. In 1896 Swingle and Webber (96) described the symptoms in detail. From 1908 to 1917 Floyd (31, 32, 34, 36, 37, 38, 39, 40, 42) reported a series of extensive studies on the problem

with particular attention being given to the morphology of the affected tissues. It was first reported in California in 1896 and is now known to occur in most of the citrus growing areas of the world (6, 9, 26, 67, 63, 85, 104, 105) and recommended treatments as well as descriptions indicate that it is of common occurrence in citrus. Cheema (24, 25) and Sahasrabudhe (90) have described a condition known as "dieback" in India but the symptoms reported by them apparently differ from those of copper deficiency.

Excessive applications of nitrogenous fertilizers have been considered for years a contributing cause for this trouble while copper has been used as a corrective for almost as long (40, 42). More recently it has been shown (19, 45, 46) that copper compounds, whether used as sprays or as soil applications, will serve as correctives for both vegetative and fruit symptoms, even in the most acute cases. Chemical analyses (45, 46) of tissues from trees exhibiting symptoms of copper deficiency have shown a much higher nitrogen content than have analyses of comparable tissues from trees giving no indications of the deficiency; and a decline in nitrogen content has been found following the application of

copper treatments to deficient trees. Considering the work up to the present this condition might be classified as either an excess of nitrogen as compared with copper or a deficiency of copper as compared with nitrogen. The latter viewpoint is the more practical since it is relatively easy to supply a deficient element but difficult to remove an excess of an element. This serves to illustrate the viewpoint, expressed in the introduction, that the term "deficiency" is a relative one.

#### Foliage Symptoms

The first symptom usually looked for as an indicator of approaching copper deficiency is unusually dark green foliage, the individual leaves being large and apparently over-vigorous. This stage may be referred to as incipient copper deficiency, since gumming and dying back of shoots may not be present. As the deficiency becomes acute and twigs start to die, some of the weak twigs will bear very small leaves of yellowish-green color which drop quickly, leaving the twig denuded. In very acute cases a peculiar malformed leaf may develop which shows, in its developmental stages, a finely netted dark green venation on a light green background. Mature leaves on affected shoots may

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by the roots and stored in the tree during the winter, ready for immediate use when vigorous activity above ground begins in the spring.

It is even more evident that citrus trees, growing in the warm Florida climate, are not "sound asleep" or "hibernating" in winter. If plant food is available in the soil, citrus trees will absorb and store this plant food for use in the spring. Be sure the nitrogen you apply now is not easily washed out of the soil. Ask for UREA, a *highly available, leaching-resistant form of nitrogen*, in your citrus fertilizer. IT STAYS PUT.

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## WHY DO WE DO IT?

For the past twenty years, which constitutes the entire life of this publication, The Citrus Industry Magazine, in common with hundreds of Florida growers of citrus fruits and many reputable shippers, has protested and deplored the all too common practice of shipping immature and unfit fruit to the Northern markets during the early weeks and months of each shipping season. These protests have had little apparent effect in checking the practice.

Elsewhere in this issue we print a communication from a lady grower at Fellsmere which represents the attitude of many (and we believe most) citrus growers. Yet the practice still continues in spite of legal restrictions and the efforts of the inspection bureau.

That people outside the industry are becoming aroused at the continuation of this practice which is costing the growers of the state millions of dollars, is shown by the following editorial from the Jacksonville Times-Union which has the hearty endorsement of this publication. The Times-Union says:

M. M. Vickers, president of the Palatka News Publishing Company, returns from Baltimore with the story of a personal experience that could be used by citrus interests of the State as a warning against permitting immature fruit to reach the markets of the great consuming areas. While attending a Kiwanis Club meeting in Baltimore, the News reports in editorial comment on the experience, a commission merchant present, learning that he was from Florida, asked Mr. Vickers to go around to a retail establishment after the meeting and see for himself the kind of Florida fruit being shipped to market.

He found Florida oranges on sale at 10 to 15 cents a dozen, less than they are sold for here at home. But when cut, they lacked any semblance of taste. "They looked fine but they just weren't anything. I wouldn't eat them myself," the Palatkan said.

Grapefruit tested in the same manner proved to be nothing but pulp. California oranges, on the other hand, were of excellent quality.

As a result, the price of Florida fruit has been knocked "galley west and will remain so despite the fact that later shipments will improve the quality of the merchandise," the News asserts, adding that "it's easy enough to knock prices down but it's almost impossible to pull them up after you've created a public antipathy to the product."

Right. And "what earthly sense is there in spending a million dollars advertising a product which is of inferior quality? Advertising to be effective must be backed by a good product. You can't take shoddy goods and sell them through advertising no matter how extensive a campaign you enter into."

There are two ways to view the situation thus created by the shipping of immature and uneatable citrus fruit to the markets of the country. First, it may be said that the fruit is produced by the growers of Florida on their

own land, in their own groves. It is their money that has been invested in the property, and it is their fruit that is being shipped, and if they want to ruin the market, and destroy their chance of disposing of their product at a profit, it is their own affair. It is up to them to say whether they want to continue a policy that not only retards the citrus industry, but threatens its ruin.

This is the narrow, restricted, selfish view. The broader, common sense way of looking at the problem is that it should be considered from the standpoint of its effect upon the economic stability, prosperity and progress of the State. Although the growers may hold fee simple title to their property, there is an inherent even though indirect right held by the commonwealth that contemplates the common weal. This right places upon the citrus industry a responsibility that should not be arbitrarily brushed aside.

It is upon the basis of this right that the Legislature has enacted the law that provides for the Florida Citrus Commission, which is empowered to exercise certain regulatory control over the coloring, grading and shipment of the fruit. It is by reason of this right that the Federal and State Governments maintain research departments whose personnel devote their time and spend the taxpayers' money toward efforts to improve the quality of fruit produced, to protect it from invasions of such things as the fruit fly, and otherwise safeguard the industry.

Growers know that the shipment of immature and unfit fruit early in the season ruins the price for fruit of excellent quality shipped later in the season. Shippers know it, the general public knows it — and the consumers in the North know it. Yet, year after year we continue the destructive practice. Why do we do it?

The recent session of the legislature enacted more stringent laws which it was hoped would remedy the evil, yet it appears that the same old colored man is still hiding in the wood pile. Evidently we need even more stringent laws with even larger and sharper teeth to protect the industry and the growers themselves from a condition which the growers could remedy by refusing to sell fruit which they would not place upon their own tables — which they would not eat themselves, or permit their wives and children to eat.

Until this deplorable practice is stopped, Florida growers and the entire state of Florida will continue to suffer financially, and the reputation of Florida citrus fruits (the finest in the world when fully mature) will continue wandering around the markets of the North begging for a buyer.

The courts are now being asked to stop the erection of the wayside sheds authorized by the last legislature. By the time the courts get around to handing down a decision it will probably be too late for the washing sheds to be of any use to the growers this season.

With this issue The Citrus Industry closes the twentieth year of its existence. During this time The Citrus Industry has endeavored to be of some service to the citrus growers of Florida. During those twenty years, the magazine has continued under the original ownership and management. Under the same ownership and management, it hopes to be of still greater service to the industry in the years to come.

# Florida Jaycees Plan Second Citrus Drive

Plans for the second annual Jaycees Florida citrus drive, which opens Jan. 1 for 60 days coincidental with the Orange Bowl football game at Miami, was further developed at the conference of the Florida Junior Chamber of Commerce at St. Augustine.

Assistance of the nearly 50 Junior Chamber of Commerce clubs in Florida will be sought in connection with the Florida citrus commission's campaign to increase the giving of Florida citrus in box lots as Christmas gifts, both by Florida businessmen and their associates in the North.

Several meetings of the state citrus committee of the Junior Chamber of Commerce have been held in recent weeks to develop preliminary plans for the annual drive, and a report will be made to the executive committee of the state organization. The citrus commission will be represented at the conference, following

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an invitation to take part in the discussions concerning citrus projects.

A report also is likely on what the state citrus committee has developed in its investigation of a proposal that citrus juice stands be established along arterial highways to welcome winter visitors to Florida. The committee met recently in Winter Haven with a group of industry representatives and discussed the juice stands at some length.

The citrus commission is seeking the aid of the Jaycees, together with all other civic clubs in Florida, in connection with its gift fruit campaign. They will be requested to bring the proposal to the attention of their memberships, and urge that letters be written to northern asso-

ciates suggesting that Florida citrus fruits are excellent Christmas gifts for friends, relatives and important customers.

## CALIFORNIA GROWERS PROTEST AGAINST THE WAGE-HOUR LAW

(Continued from Page 7)  
ing house workers last July 8. An appeal has been taken by the Administrator of the Wage-Hour Act claiming that the Federal court lacks jurisdiction to hear the case.

Citrus growers in Texas have brought a similar complaint in Federal court there and this is now under submission awaiting a decision. The complaint was filed October 14.

## IRRIGATION

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**Swift & Company  
Fertilizer Works**

Bartow, Florida

A Division Of Swift & Company

# SOME SYMPTOMS OF CITRUS MALNUTRITION IN FLORIDA

(Continued from page 9)

show a very slight reddish sheen due to a finely divided gummy excrecence.

## Twig Symptoms

In the incipient stages of copper deficiency the twigs are unusually vigorous, long, soft, angular, frequently "S" shaped and more or less drooping; in contrast to the short, round, and compact twig indicative of normal growth. As the deficiency becomes more acute gum pockets may form between the wood and bark of the twig near the leaf bases. In severe cases the leaves are shed from the young twigs and they die back often to the point where the new growth originated, giving rise to the popular name, "dieback". The twig is covered by a reddish brown gummy excrecence which is typical of the condition. Associated with the above symptoms, multiple buds are developed and these produce growth that eventually dies back in the manner described. The "bushy" type of growth commonly associated with the above symptoms is, in reality, due to zinc deficiency although commonly thought to be a symptom of copper deficiency because it is so often associated with it.

## Fruit Symptoms

Fruit symptoms are most pronounced on oranges. Brown excrecences of hardened gum on the rind of the fruit are a commonly recognized symptom of incipient copper deficiency since this symptom, in a mild form, may precede the appearance of leaf and twig symptoms. These markings, plus the generally poor quality of the remaining fruit, result in an overly large proportion of the crop being thrown into the lower grade even though the deficiency has not become obviously acute. Splitting of fruit is common on trees showing mild symptoms of copper deficiency, with a part of the splitting starting at the blossom in the usual way but some of it taking place across the axis or around the gummy excrecences. The latter types of splitting are irregular and are associated with the hardening of the rind in areas covered by the markings. Such fruits usually show gum pockets in the rind and around the seed.

In acute cases the young fruit is light green in color and disfigured by light brown markings or excrecences, which darken and converge as time progresses and may become almost black by the time the fruit is half grown. Growth of the fruit is arrested and trees showing pronounced symptoms on both growth and fruit

will have shed most of their fruit before the period of normal maturity. The few fruits remaining on the tree are low in acid, high in nitrogen, and low in juice content. Such trees usually bloom profusely in the spring and set a heavy crop of fruit which is shed by summer.

Fruit symptoms as described for oranges are not of common occurrence on grapefruit and are more likely to involve a limited portion of the fruit surface. This results in lopsided fruits due to the fact that the area covered by markings does not grow properly. Such fruits usually show gum pockets in the rind and occasionally gum around the seeds. When a few fruits are thus affected the remaining fruits on the tree have a thick coarse rind that takes on a yellow color with maturity and the albedo and pulp are yellowish instead of light colored. Such fruits frequently develop deep brown pits in the rind while still on the tree.

## Modifications of Symptoms

In the presence of other deficiencies the symptoms of copper deficiency may be considerably modified. This is particularly true when copper deficiency is combined with either zinc or magnesium deficiency. Since both of these effect a restraining influence on growth, the marked vegetative response that is characteristic of copper deficiency will be greatly reduced and the long growth and over-vigorous leaves may not be apparent. Instead of the long dead twigs so characteristic of copper deficiency there will be dead twigs only an inch or two in length. Such effects are primarily modifications of the vegetative symptoms and trees which are so deficient in magnesium and zinc as to make the vegetative symptoms of copper deficiency unnoticeable, except to the experienced eye, will still exhibit the typical fruit symptoms. As a consequence fruit symptoms are the most reliable indicator in routine observations.

On very light sandy soils that have been allowed to become very acid (pH 4.5 to 5.0) acute deficiencies of magnesium, zinc and manganese, as well as copper, are extremely common, so that a study of these modifications is important in making diagnoses. Symptoms of magnesium deficiency may not be readily apparent if copper deficiency is so acute as to cause the loss of the crop. Copper

applications under such conditions frequently result in heavy cropping followed by acute magnesium deficiency.

## Varietal Susceptibility

While all kinds of citrus may show symptoms of copper deficiency occasionally, oranges are much more commonly affected than grapefruit or tangerines. Pineapple and Valencia oranges appear to be somewhat more likely to develop symptoms than other varieties but careful differentiation as to copper requirements remains to be made. Young trees of all varieties are more frequently affected than older trees, probably due to the relatively heavier applications of nitrogen and the fact that such trees are seldom sprayed with bordeaux.

## Causation

A deficiency of copper in sandy soils seems to be brought on most often by allowing the soil to become too acid, as by the excessive use of acidic fertilizer materials. Under such conditions copper is probably leached out of the soil until it becomes deficient. Factors that promote leaching, as excessive cultivation, low pH, and lack of cover during the rainy season, are commonly associated with the occurrence of the deficiency. Practically, the blame is usually laid to excessive applications of nitrogen. Since, as mentioned above, the junior author has shown an apparent relationship between the utilization of nitrogen and the presence of copper, this is easily understood. However, it should be remembered that at very low levels of available copper the symptoms of copper deficiency can occur without being associated with an excessive supply of nitrogen. Symptoms of copper deficiency occur frequently in groves on marl soils that are very high in pH and there is some indication that copper is fixed in such soils when the pH approaches 8.0. Difficulty in classifying the underlying causes is experienced because of the common use of bordeaux for disease control which incidentally supplies the needed copper for nutritional purposes by a sorption through the leaves.

## Treatment

One of the earliest treatments was to starve the grove for nitrogen but some of the earlier workers also reported favorable results from the application of large amounts of organic material, even though organic ferti-

TABLE 2.—Effect of Copper and Zinc Treatments on Production in an Orange Grove Acutely Affected by Both Copper and Zinc Deficiencies.

| Treatment               | No. trees | Boxes per tree | Percent 1's and 2's | Percent 3's | Percent Culls |
|-------------------------|-----------|----------------|---------------------|-------------|---------------|
| Check                   | 18        | 0.7            | 16.0                | 80.0        | 4.0           |
| Zinc spray              | 46        | 0.8            | 25.2                | 67.2        | 7.7           |
| Zinc and copper spray   | 10        | 2.7            | 66.7                | 32.4        | 0.9           |
| Copper spray            | 6         | 2.7            | 62.7                | 35.5        | 1.5           |
| Copper soil treatment   | 5         | 1.6            | 50.0                | 20.0        | 0.0           |
| Copper and zinc on soil | 7         | 1.9            | 65.4                | 34.6        | 0.0           |

All sprays applied 30 days ahead of bloom and fruit picked 15 months later

lizers were frequently blamed for the appearance of the symptoms. This apparent anomaly can probably be explained by the presence of traces of copper in such materials. Copper was used in the form of bordeaux, and copper sulfate crystals were frequently placed under the bark, but the latter practice has practically died out because of the excessive gumming and killing of tissues caused by it. Later workers indicated that copper sulfate applied to the soil was a satisfactory corrective treatment. At present copper is commonly applied in spray form when it is needed also for disease control, and to the soil when an application of a copper spray is to be avoided. In the latter case copper sulfate is commonly applied at the rate of one-quarter to two pounds per tree either as a separate application or combined with the fertilizer. Response to the spray is quicker than that to soil applications, a copper spray applied at blooming time commonly effecting an almost immediate recovery.

Table 2 contains results of a typical experiment in which the effects of copper and zinc sprays and soil treatments on production were studied on trees deficient in both elements. Sprays applied 30 days before bloom not only increased the production but also raised the grade; soil applications at the same time were not quite so effective in production increase; and zinc applications were useless in correcting copper deficiency, although they corrected the symptoms of zinc deficiency. In interpreting this table it should be pointed out that plots receiving zinc spray applications were interspersed between the other plots so as to give an over-all picture of the entire area, and that zinc sprays, while raising the percentage of 1's and 2's slightly, did not significantly raise the total number of boxes per tree. Wherever copper was applied, however, either on the soil or on the tree, there was a marked response with the total production being somewhat higher where copper was used as a spray than as a soil treatment. Variations between the last two items, namely, copper sulfate applied alone to the soil and copper applied with zinc, are not significant owing to the small number of trees, but the difference between these two as a group and the two copper sprays is significant. Throughout these experiments zinc sprays gave complete control of frenching and zinc soil treatments failed to give any noticeable control; but as in many other groves, copper deficiency was a controlling factor in production. Only by applying copper could a crop be retained on the

trees.

Zinc deficiency is commonly known as "frenching" (Florida), "mottle-leaf" (California and many foreign countries), and "folio-cellosis" (proposed by Fawcett). It is probably the most widely spread deficiency of citrus and the best known, although its cause and control have been worked out only recently. The use of zinc as a corrective in California developed from experiments with iron and zinc sulfates on little-leaf of deciduous fruits (Chandler, Hoagland and Hibbard, Johnston, Thomason, Parker); and in Florida from work with zinc on bronzing of tung trees (Mowry and Camp, Camp and others). Similar results have been reported from South Africa by Matthews and Matthews and Powell, by Strickland, in Australia and numerous workers in other citrus growing areas. Subsequent to the discovery of the value of zinc in the field Chapman, Vanselow and Liebig were able to produce the symptoms by growing citrus trees in zinc-free culture solutions and to correct the condition by addition of zinc. At present zinc sprays are widely used on citrus in both California and Florida and are generally accepted as an integral part of the program of citrus tree nutrition.

Zinc deficiency symptoms have been associated for many years with copper deficiency symptoms in Florida, as the two commonly occur together. Many earlier workers considered them symptoms of the same condition. At present the work shows clearly that they are only associated insofar as soil conditions may produce a deficiency of both at the same time and that each may occur independently.

#### Foliage Symptoms

The very striking leaf symptoms are characterized by irregular green bands along the midrib and main veins on a background of light yellow to almost white. The relative amounts of green and yellow tissue vary from a condition of mild zinc deficiency in which there are only small yellow splotches between the larger lateral veins to a condition in which only a basal portion of the midrib is green and the remainder of the leaf is light yellow to white. In less acute stages the leaves are almost normal in size while in very acute cases the leaves are small, pointed, and abnormally narrow, having not over a tenth of the area of normal leaves. The tendency to produce narrow and pointed leaves is one of the very distinct symptoms of zinc deficiency. In the immature leaves the area between the veins is usually light green but this rapidly

fades to the characteristic green and yellow pattern. The pattern is developed coincidental with the development of the leaf and mature green leaves have not been observed to become mottled.

#### Twig Symptoms

In mild cases zinc deficiency symptoms appear on occasional weak twigs and particularly on shoots produced at other than the regular flushes of growth and the remainder of the foliage seems normal. When more acute, leaves will be affected over the entire periphery of the tree, and the twigs will be very thin and short with a marked tendency to erect, bushy growth. This type of growth, combined with the erect, narrow leaves with their characteristic pattern, gives the tree a very bushy appearance. The twigs are weak and die back rapidly so that there is always an excess of dead wood in the tree and the tree is reduced in size by the pruning that is constantly necessary. Coincident with the dying back of the outer twigs, a profuse development of watersprouts occurs on the outer limbs and trunk. These watersprouts commonly produce leaves free of the pattern, or nearly so, and the tree has a dense growth in the center in contrast to the dying appearance over its periphery.

#### Fruit Symptoms

Fruit borne on weak twigs is very small, the rind is smooth and the color, when ripe, unusually light. The pulp of such fruits is woody with a very low juice content and the taste insipid due to reduced acid content. Fruit borne on the watersprouts is large, coarse and rather woody; in acute cases it is mostly either very small or very large culls. While the production of a very large proportion of culls is a common characteristic, production may cease almost entirely when the deficiency is unusually acute.

#### Modification of Symptoms

In the presence of other deficiencies the symptoms described above will be little changed except that copper deficiency may cause all the crop to shed. In the case of deficiencies which inhibit vegetative growth the response expected from zinc treatments will not be experienced and may be largely limited to the greening up of the yellow foliage with very little growth; this is particularly noticeable when magnesium as well as zinc is deficient. Zinc deficiency symptoms are commonly much more acute on trees suffering from copper deficiency than on similar trees that have been treated with copper. This is

probably due to root injury associated with copper deficiency which reduces the ability of the tree to absorb zinc and other nutrients. A similar condition is occasionally found where magnesium deficiency is acute and probably for the same reason.

#### Varietal Susceptibility

Zinc deficiency symptoms are most common on oranges, less common on grapefruit and least common on tangerines, although they may and do occur on all types and varieties. Pineapple oranges are commonly most severely affected, with Valencias and other mid-season and late varieties falling practically in the same category; early orange varieties are less likely to show the symptoms under comparable conditions but it is more a matter of degree rather than a difference between presence and absence of symptoms. As with other deficiencies unfavorable rootstock combinations or anything that weakens the root system of the tree increase both its incidence and severity.

#### Causation

Zinc deficiency symptoms were commonly associated in Florida with over-liming (41, 43) and recent work indicates that when sandy soils are limed sufficiently to raise the pH above 6.0 zinc deficiency occurs (Camp and Reuther, 18, 19), probably due to fixation of zinc in an unavailable form. The exact pH at which fixation occurs has not been determined but for practical diagnostic purposes a pH of 6.0 can be taken as the dividing point, since in surveys 80 to 90 percent of the groves growing on sandy soil with a pH higher than 6.0 which had not been treated with zinc in any form were affected by zinc deficiency. Zinc deficiency has been found also on soils containing sufficient marl to raise the pH above 6.0.

When sandy soils are allowed to fall below a pH of 5.25 zinc deficiency symptoms usually will appear, first in a mild form and later more pronounced. Whether this is caused by leaching or fixation of zinc has not been determined definitely but the former is believed to be the primary cause. Under such conditions zinc deficiency is likely to be associated with manganese, magnesium, and copper deficiencies. Groves on sandy soils maintained within a pH range from 5.5 to 6.0 seldom exhibit zinc deficiency until the trees become relatively old and in such cases the deficiency may be due to "cropping out." Tung groves and Satsuma orange groves planted on old cotton and corn lands frequently exhibit zinc deficiency due to "cropping out" but an analogous situation is not common in

the main portions of the citrus belt. It should be pointed out that the above remarks refer primarily to groves on soils that have remained in this pH range (5.5-6.0) for many years. Grove soils that have been allowed to become very acid and then treated to bring the pH back to the indicated range do not present an analogous condition.

Numerous theories have been developed as to the role of zinc in the plant and the soil or plant mechanism involved in the occurrence of the deficiency. Since little would be gained in including such a discussion in a publication of this type the read-

er is referred to Chandler (20) for a discussion of the various theories that have been advanced.

#### Treatment

Zinc sprays are generally recommended for the treatment of zinc deficiency. These have been much more effective and cheaper than have soil treatments even though they may entail an oil spray for scale control under Florida conditions. This probably is easily explained, first by the fact that zinc deficiency commonly occurs on soils that have a high fixing power for zinc so that large amounts of a relatively expensive material would be required for correction, and

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second because the root system is usually seriously impaired by the deficiency and does not readily absorb zinc. Applications to the soil have given very satisfactory results with both citrus and tung trees when the soil was within a favorable range of pH (5.5 to 6.0) and the deficiency due in all probability to "cropping out", but such conditions are rare in commercial citrus in Florida and the deficiency is due primarily to adverse soil conditions. It is probable, however, that further research work will make it possible to control the sandy soils in such way as to eliminate the necessity for spray applications.

The sprays used in Florida generally contain zinc sulfate neutralized with hydrated lime or liquid lime-sulfur. For the initial correction zinc sulfate is used at the rate of 3 to 5 pounds per 100 gallons with one-half as much hydrated lime, and for maintenance at the rate of 1 to 3 pounds per 100 gallons, also with hydrated lime as above. This spray is commonly combined with copper or sulfur sprays for pest control. The same type of spray is used in California, as is also zinc oxide which has been found to be somewhat hazardous in Florida if applied on young foliage or fruit. Metallic zinc dust combined with other dusting materials also is recommended for some conditions in California.

Responses to sprays are very rapid and affected leaves turn green within a maximum of 30 days after the spray is applied except during the winter months. Leaves on the tree when the spray is applied will not grow appreciably in size although they will become green, but the new foliage will be normal in size and character if not affected by some other deficiency. Trees completely out of production for three years due to zinc deficiency were sprayed in early May and set some June bloom and almost a full crop the following season, and severely affected trees that had not died back more than 15 to 20 percent were returned to production during the current year when sprayed 30 days prior to the spring bloom.

(To Be Continued)

#### BIG CONTRACT FOR NITRATE SHIPMENTS

One of the largest commercial charter contracts in the recent history of American shipping has just been arranged between the Chilean Nitrate Sales Corporation and Lykes Bros. Steamship Co., Inc.

The contract calls for the service of seven ships carrying Chilean Nitrate from Chilean ports to the Uni-

ted States. Joseph T. Lykes, vice president of the steamship company, pointed out that the ships formerly operated in the European trade. They have an aggregate deadweight tonnage of 65,000 tons and during the six months' period of the charter will transport approximately 275,000 tons of the Chilean natural fertilizer. Under the terms of the contract the ships will not compete with any existing American service.

"This contract represents an adjustment of American shipping to the requirements of the Neutrality Act," stated J. A. Woods, president of the Chilean Nitrate Sales Corporation. "It enables these ships to continue to employ American crews and enables them to replace their lost European business by trade with South America."

In addition to the very substantial payment to the American steamship company in charter hire, these Chilean nitrate shipments will pay approximately one-quarter of a million dollars to the U. S. government in the

form of Panama Canal tolls, and more than a quarter of a million dollars for stevedoring and warehouse charges in the United States.

#### NATIONWIDE CITRUS DRIVES BEGIN

(Continued from page 6)

would make a vigorous attempt during the December drive, however, on all three citrus fruits.

Outlets cooperating are affiliated with the National Association of Food Chains and the Independent Food Distributors Council. Announcement that the food chains group would take part in the sales was made by the Florida Association of Chain Stores on behalf of the national organization.

A third sale on all three fruits has been scheduled for January 18-27. Other drives will be discussed by the national citrus merchandising committee when it meets again in January.

## NATURAL CHILEAN NITRATE OF SODA

### Plenty of it! No Increase in Price

There will be no increase in the present price of Natural Chilean Nitrate of Soda during this entire season ending June 30, 1940. You can get all you want. Large supplies are in the United States now and ships are regularly bringing in additional cargoes to meet the expected increase in demand.

Plenty for everybody's needs... no increase in price.



**YAS SUH, FOLKS..  
AN' NOW WE'S  
BACK ON YO' RADIO**

**TUNE IN** Beginning SAT. NOV. 25 • SUN. NOV. 26  
**ON YOUR RADIO**

Enjoy the Uncle Natchel program every Saturday night on WSB, WRVA, and WSM, and every Sunday afternoon on WIS, WPTF, WBT, KWKH, WJDX, WMC, WWL, WAGF, WDBO, WSFA, WJRD, WJBY.

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# The LYONIZER

Department

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## Salesmen Report From The Field

### West Central Florida

#### E. A. McCartney

The Brooksville and Floral City area is suffering quite badly from the lack of rain. Many young groves in this section are beginning to show signs of wilt. The tangerine crop in Hernando county is beginning to move to the market, and growers throughout the section that used our fertilizer are well pleased with the quality and quantity of their crop. Vegetable crops throughout this territory are in very good condition and those growers fortunate enough to have produce to place on the market at this time are receiving very good prices.

### Polk & Highlands Counties

#### J. M. Sample

Growers throughout this territory are showing a great deal of interest in their fall application of fertilizer, with many of our customers requesting a complete range of secondary elements in the fertilizer mixture. Our groves as a whole are in very good condition, and show plainly the value of real quality fertilizer. The dry weather of the past few weeks has delayed fall application in many cases, but with just a little rain most growers will show more interest in getting their fertilizer on the grove.

### East Coast

#### F. W. Scott

Planting of vegetables on the East Coast and Lake Okeechobee sections is progressing very rapidly. Heavy rains have delayed and damaged crops in practically the whole section, but the acreage lost is rapidly being replanted. Market conditions look very good at this time, and practically all types and varieties of vegetables are bringing a good price, and growers are feeling very much bet-

ter about future prices. The recent opening of the Farmers Market at Pompano was well attended and indications point to this becoming a very valuable project to farmers on the lower East Coast.

### Southwest Florida

#### Frank Dillinger

During the past few days we have had several showers that will have a very definite importance in improving vegetable crops in the Manatee and Sarasota sections. This section is beginning to move produce to the market, and to date the prices have been extremely good, with practically all commodities in heavy demand. Celery in the Sarasota section would be greatly benefitted by a little cool weather. All crops in Manatee county weathered the east winds of the past few weeks in good shape, and the tomatoes in the Ruskin area are looking good.

### North Central Florida

#### G. W. Phillips

Central Florida citrus groves are beginning to show signs of the drought, with many groves dropping fruit, and the tree foliage showing considerable curling. As a result a great deal of irrigation is being done. Due to the dry weather most of our growers have delayed their fall fertilizer application, but are planning to make this application with the first signs of some moisture. Fruit prices throughout this territory are ranging around 65 cents for grapefruit and oranges with tangerines up as high as 75c per box.

### Hillsborough and Pinellas Counties

#### C. S. Little

Groves throughout this territory are looking very good at this season of the year. It is getting extremely dry in some sec-

## Personal Items

DeWitt Taylor of Detroit, Mich., and Winter Haven, recently returned to his grove in Winter Haven for a brief stay, after spending the past three months in the north.

Our very good customer, C. D. Carlton, Lutz, has one of the finest crops of fruit in the state. This man always gets a premium for his fruit, and is convinced that Lyons' quality fertilizer is instrumental in the production of his Greater Quantities of Quality Fruit.

Ralph Harville of Spring Lake, has recently built a new home in one of his groves overlooking the lake. Ralph has a very fine home, and being situated in a Lyons fertilized grove he knows that he will always have quality fruit to serve his friends at home, and greater quantities of the same kind of fruit to send to the market.

"Phonso" Smith, our agent at Lakeland, has been sick for the past week, but we are glad to report that he is back on the job again. Remember, Phonso, this is the busy season and you cannot take time out at this season of the year to rest up for the Christmas holidays.

tions and many growers are beginning to irrigate their property. Fruit is being moved from many groves, and the prices are only fair. We expect to have all our groves fertilized by the middle of December with most growers using a well balanced fertilizer. It is interesting to note that so many of our customers are including secondary elements in their regular mix. We feel that our program of passing on experimental information to our customers is bringing results, and many growers are consulting us about the program of fertilization they should use on their property.

## DECEMBER SUGGESTIONS FOR GROVE AND FARM CARE

Prepared By Horticultural Department, Lyons Fertilizer Co.

### SPRAYING

Watch out for rust mites, particularly on Valencia oranges. They can still turn that bright fruit rusty. Keep close check on all insects and diseases on your vegetable crops. Ounce of prevention is worth pound of cure.

### BANKING

Non-bearing trees likely to be exposed to severe cold should be banked with soil from which all sticks, grass and other trash have been removed. This will prevent damage from wood lice.

### FERTILIZER

If you have not already made your fall fertilizer application make plans to do so at once. The Lyons field man in your territory will be glad to advise with you as to the proper analyses to use. For all vegetable crops be sure and keep them growing vigorously, with the judicious use of the mixtures we recommend for your particular crop.

### PRUNING

Prune all dead wood and water sprouts from trees. By removing dead wood at this time you will accomplish a great deal in control of melanose on your fruit crop next year. Treat very thoroughly all trees affected with gummosis, foot rot, etc. Consult the Lyons man for proper method of treating these diseases.

### PLANTING NEW TREES

This is a very good time to make preparations for replanting trees in the old grove. These trees should be planted in January, but now is the time to make all plans for future operations.

### GENERAL

Better plan for irrigation system if you have not already done so. Experience with recent droughts has shown many growers the need of making some provision for water.

Guy Maxcy, our representative at Sebring, is in the Everglades on a hunting trip this week. Guy is a great out-of-door man, and we feel sure that he will bring home plenty of game. Incidentally, Guy is one of the best grove men in the section, and will be glad to advise just what Lyons formulae are best suited to your grove.

We would like to call to your attention Frank P. Goodman's home grove in Lake Alfred. By extremely efficient operation he has made this one of the outstanding groves in the state. His crop of early grapefruit this year has been praised by the buyer as being one of the best in quality that he has ever handled.

Our good customer W. D. Draper, Thonotassassa, has just recently returned to his home from an extended trip in the north.

L. G. Ferris and some of his friends from Wisconsin arrived recently in Floral City, where Mr. Ferris has one of the outstanding groves in the state. Mr. Ferris spends most of the winter on his property and is improving it constantly. Florida welcomes men of his kind as growers of fine fruit and boosters of the state's citrus industry.

Russell Farmer, of Farmer's Feed Store, Wauchula, our agent, is an old grad of the University of Tennessee. Russell thinks that Tennessee has one of the finest grid teams of the nation, and is expecting them to land a choice bowl game for New Year's Day. Being a booster of Tennessee makes Russell tops in two divisions — in addition to a great football team, he also has a great line of fertilizer to boost.

Well, when we visit Hernando county in the future we are assured of a new place to put on the "feedbasket." Young Pierce Kimbrough has recently completed a new home, and in addition to giving us more elbow room at his Father's table, we are looking forward to the pleasure of showing young Mrs. Kimbrough just how well we like her cooking.

A man doesn't fall in love with the woman he understands, but with the woman who understands him.

## Little Bits of FUN



### DOUBLE ERROR

A young school teacher entered the bus and sat down. She looked at the gentleman across from her and smiled very sweetly. He looked puzzled. Realizing that she didn't know him she stammered:

"Oh, sir, please forgive me. I thought at first you were the father of one of my children."

At the next corner she left the bus.

New Circus Actress: "You know this is my first job in a circus. You'd better tell me what to do to keep from making mistakes."

Manager: "Well, don't ever undress in front of the bearded lady."

An Irishman had been thrown over a fence by an enraged bull. He had just recovered when he noticed the bull pawing the ground and furiously tossing his head.

"If it wasn't for your bowing and scraping," said Mike "I'd think yer threw me over on purpose."

### TOO MUCH CAMOUFLAGE

Two farmers were waiting for their train, when along the platform tripped a fashionably dressed damsel, complete with lipstick, rouge and powder. The two men gazed at her speechless for a moment. Then one spoke:

"Man Tam, what dae ye think o' that noo?"

"Think," exclaimed the other, "nathing ava'. It's gey puir land that needs sae muckle top-dressing."

Entries in a small boy's diary:  
Feb. 24: Got an air gun for my birthday.

Feb. 25: Snowing. Can't go hunting.

Feb. 26: Still snowing. Can't go hunting.

Feb. 27: Still snowing. Shot at Grandma.

## AMONG OUR ADVERTISERS...

The traveller whose way lies through the rolling grove-covered hills of the middle ridge section of Imperial Polk County, needs no road map to identify Waverly — home of the Waverly Growers Cooperative Association.

From over the brow of every hill, from around every corner, and from every side road, or so it seems, he will meet one of the Association's huge, flaming red trucks bearing the name of that model cooperative group whose membership numbers some 180 growers controlling approximately 5,200 acres extending over a 20-mile radius from the huge packing plant which comprises most of the little town of Waverly.

Sufficient unto itself is this cooperative enterprise, for it produces, harvests, packs and markets its own fruit.

Small wonder then that the highways of this section literally teem with "Waverly Growers" trucks, for these highly diversified activities require a fleet of trucks which run the gamut in size, from the runabout pick-up, to the gigantic cross country van. Indeed transportation is an item of paramount importance with the men who administer the association's affairs.

James C. Morton, general superintendent, smiled when we asked for a statement on this all important question. "I'm afraid," he said, "that there is little I can say that would be of interest. Here in the office our motorized equipment is represented by files of statistical data, costs, maintenance and performance. We think of trucks in terms of figures. Suffice it to say, we are highly pleased with our transportation facilities. The man you want to talk to however is our maintenance superintendent, for he it is that literally and figuratively, makes the wheels go round."

We found E. L. Kelly, the association's maintenance superintendent, ensconced in his compact little office, from which he directs the operations of this big fleet of juggernauts. "How," said we, "would you describe this fleet of yours in a single sentence?" And without a second's hesitation he shot back "They're always ready."

He continued, "It's a big job we're doing here. Our mechanized equipment travels around a million miles annually. We move approximately 1,250,000 boxes of fruit each year and in addition haul and spread some 18,000 tons of fertilizer. The seven big cross country van type trailers which haul much of our fruit to the northern markets, return filled with

fertilizer and crate materials, and they do it right through the heart of the Blue Ridge mountains. That's hauling for you, mister.

"We select our transportation facilities with three main characteristics in mind, Dependability, Efficiency and Economy. When you combine these three in any truck, you can rest assured that you're doing a real job.

"It's a tough job too," said Kelly, as he watched a big truck churn steadily through a grove across the road, loaded with fruit for the packing plant. "There are times when we operate on a twenty-four hour basis when the rush is on and believe me, operating conditions in the field are vastly different from pavement hauling. It takes real equipment to deliver the goods."

Under Kelly's supervision, the association at present is operating 27 Internationals out of some 49 motorized units.

In the interests of operating efficiency the association has been standardizing its equipment since 1936.

### FLORIDA CITRUS GAINS IN CHICAGO AREA

Florida is shipping twice as many oranges to Chicago as it did two years ago.

Figures compiled by the Florida citrus commission from unloadings in Chicago as reported by the federal-state market news service show that Chicago received 3,142 cars of Florida citrus during the 1938-39 season. During the season two years earlier, Chicago unloaded 1,386 cars. The gain in two years has been 1,756 cars.

### CLASSIFIED

## Advertisements

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**FOR SALE** — Niagara power duster, Model F, good as new, equipped with 4 HP Cushman engine, mounted on iron wheel truck. \$250. C. O. Reiff, Marianna, Fla.

**40,000 CITRUS TREES For Sale** — Selling out cheap. All standard varieties. A. M. Harvey, 818 South First St., Winter Haven, Fla.

California has lost ground with orange unloadings in the Chicago market, the figures show. During the 1936-37 season, California shipped 4,169 cars of citrus while last season the unloadings amounted to 4,030, a loss of 139 cars.

Despite a tremendous increase in Texas competition on grapefruit, Florida has been able nearly to hold its own in the Chicago area. Texas shipped only 834 cars of grapefruit to Chicago in 1936-37 and shipped 2,055 cars last season. During the same two years, Florida grapefruit reaching Chicago dropped from 713 to 646 cars, a loss of only 67 cars in the face of freight rate advantages for Texas.

**LEMON SEEDLINGS**—20 M rough lemon seedlings pencil size to half inch. W. M. Caldwell, Box 272, Sebring.

**CITRUS BUDS AND SEEDLINGS**—Usual Standard Varieties on Sour Orange Stock, also Sour Orange Seedlings. Nursery at Blanton, Pasco County. For information and prices, write R. P. Thornton or H. S. Pollard, Copothorn Nurseries, Box 2880, Tampa, Florida.

**MANURE** — Stable and Dairy Manure in car lots. Write for prices. P. O. Box 2022, Jacksonville, Fla.

**CITRUS SEEDLINGS**; Cleopatra, Sour, Sweet, Rough Lemon, Grapefruit. Grand Island Nurseries, Eustis, Fla.

**CROTALARIA SPECTABILIS** and Hay Peas. Write for our prices. We also have a full and complete line of all farm seeds. Robinson's Seed Warehouse, Cairo, Georgia.

**ALYCE CLOVER SEED**. Ripe and cleaned. Ideal cover and hay crop. Write for information. P. E. Snyder, Box 866, Lakeland, Fla.

**CROTALARIA SPECTABILIS** — Fresh crop, \$15.00 per 100 lbs. f. o. b. Frostproof, Fla. Milton Woodley, Frostproof, Fla.

**CHOICE Rough Lemon Seedlings** 6 to 20 inches high, \$10.00 per thousand. Olan Altman, Sebring, Florida.

**"MAIL ORDER Operator** desires contact with grower of high grade avocado pears. Have interesting proposition for grower of highest quality fruit." F. R. Gardner, P. O. Box 528, Greenville, Pa.

**LARGE AND SMALL orange groves** for sale also acreage suited for citrus culture, dairying and general farming. Charlton & Associates, Valuation Engineers and Real Estate Appraisers, Ft. Lauderdale, Fla.

**CITRUS NURSERY TREES**; Standard and new varieties. Low prices for Fall planting. Grand Island Nurseries, Eustis, Fla.

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